

Unidentified Lines of *AT2017gfo*

Note, the following is a set of heavily binned plots

Hi Darach,

So I tried by eye looking through residuals to pick up some lines for Dublin. This is a first attempt and maybe I can find a bit more around if anything is constrainable. I don't know if you still need this, but just in case here you go. I have not thoroughly looked through any spectra after day 8.

There are three lines, which are bordering or within the telluric regions, and thus hard to constrain (the two gaussians we previously discussed [below called 1+2], and the one absorption-feature feature at $1.35 \mu m$ [3]).

[4] is a really interesting **absorption** + **emission** feature at respectively $0.65 \mu m$ and $0.76 \mu m$. I have added three cutouts in the last slide, to emphasise how P Cygni-ish it looks relative to the continuum. Notable, the velocity difference between peaks by eye roughly match the velocity of the photosphere in these epochs.

[5] is a emission component, visible in epochs 4 and 5, but at the tail-end of the Sr emission peak, it is a bit hard to constrain. Maybe more P-Cygni like (if Sr emission peak looks different than we have fit).

Fundamentally, the Strontium P Cygni changes a lot in shape after the 4th / 5th epoch. There is almost no absorption relative to a huge peak in emission. It also is a bit redward of the previous emission peaks of strontium. Could this perhaps be a new line? Here labelled [6].

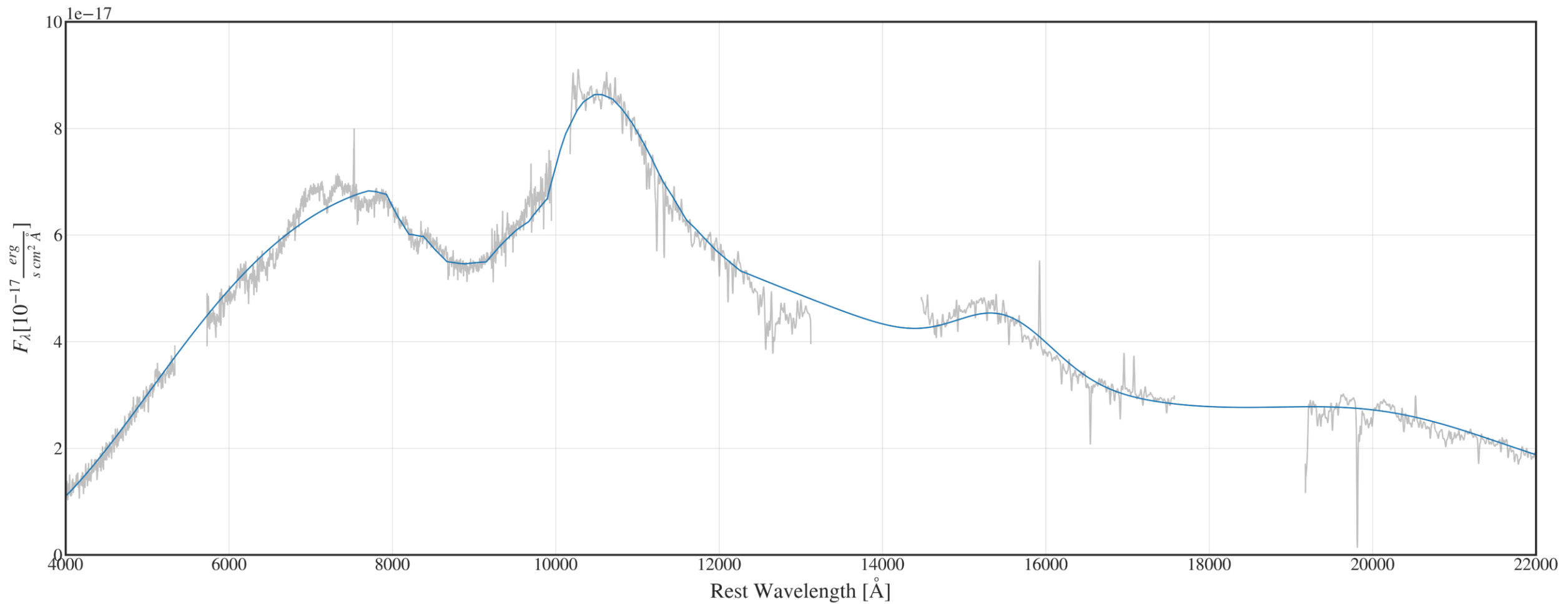
[7] might be another P Cygni seen in very late epochs. It seems too blueshifted, to match the strontium absorption peak in late epochs.

Anywho, I hope this may be of any use. Kind Regards, Albert

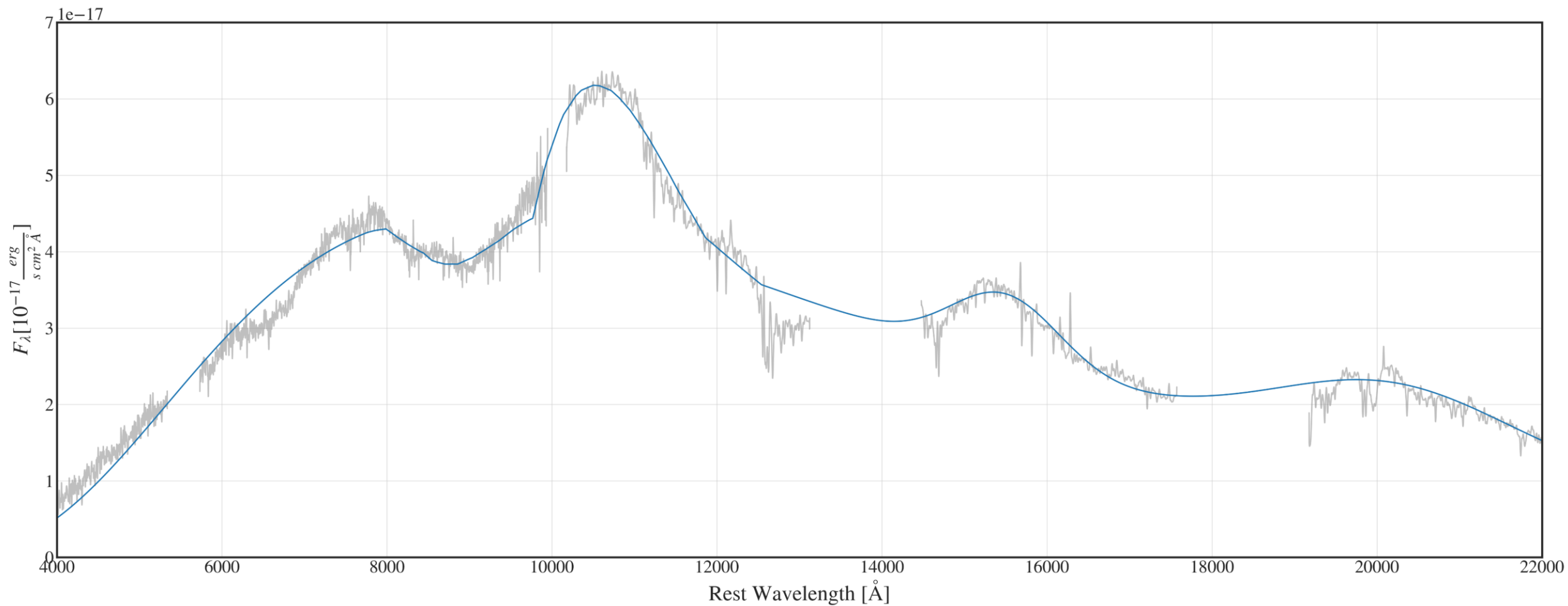
Peaks

#	λ_{emi} [Å]	λ_{abs} [Å]	Visible from	Type
1	1.55 μm	N/A	2nd Epoch	Emission (absorption within telluric)
2	2.02 μm	N/A	2nd Epoch	Emission (absorption within telluric)
Not previously included in fits:				
3	N/A	1.35 μm (telluric)	2nd epoch	Absorption/Emission (P Cygni)
<i>Note for 3; only part of emission portion is outside telluric region. The line is completely unconstrained, but confirmed by HST spectra</i>				
4	0.76 μm	0.65 μm	3rd Epoch	Absorption/Emission (P Cygni)
5	1.22 μm	N/A	4th/5th epoch	Emission
6	1.1 μm	N/A	4th/5th/6th epoch?	Emission
<i>Note for 6; in late epochs the p-cygni absorption line of Sr-II disappears, but emission increases relative to continuum. Potentially this looks like an entirely different line (not centered at the three lines of Sr-II)</i>				
7	0.92 μm	0.84 μm	7th epoch	Absorption/Emission (P Cygni?)

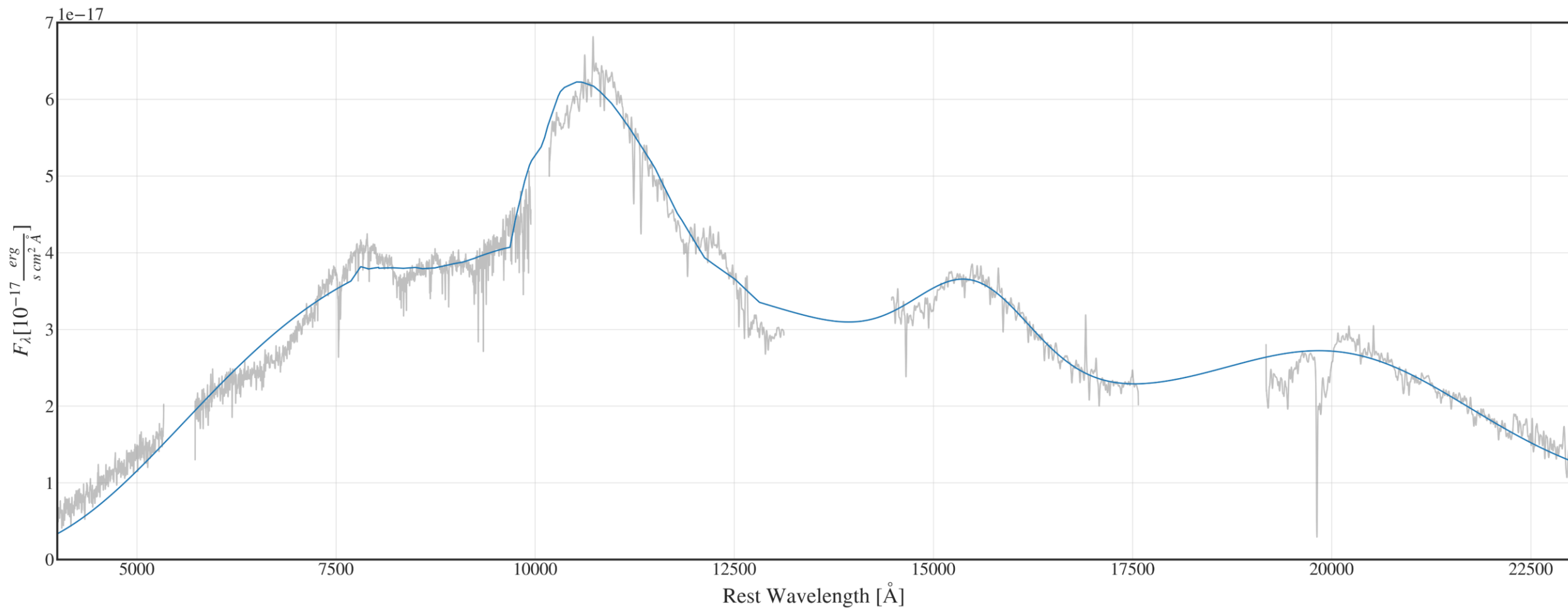
3rd Epoch



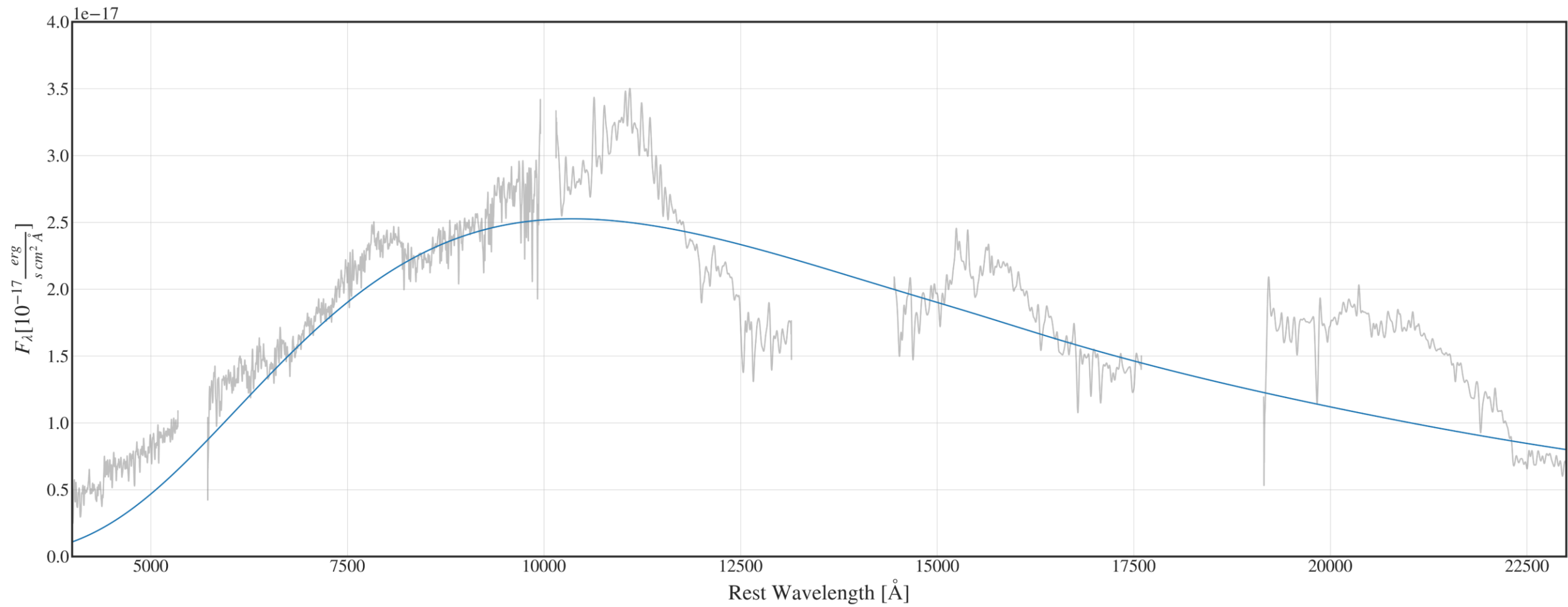
4th Epoch



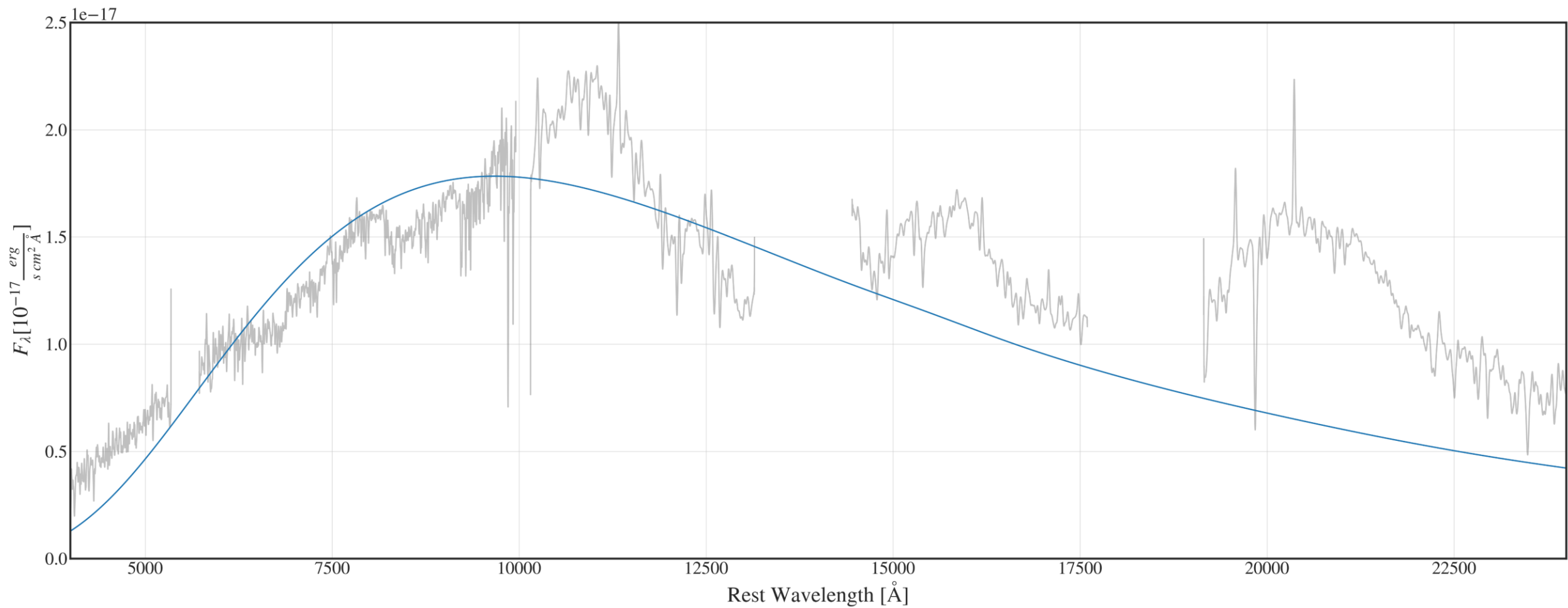
5th Epoch



6th Epoch



7th Epoch



Peak number 4 (cutout of epochs 4,5)

